Mathematicians usually use one of two particular constants for the base of an exponential function: either 10, which is the base of the decimal system, or the naturally occurring number e, which equals 2.71828…. To make the equation more general, multiply the variable in the exponent by a constant. The (untranslated) general equations are given in the box.

DEFINITION: Special Exponential Functions

$y = a \cdot 10^{bx}$ base-10 exponential function

$y = a \cdot e^{bx}$ **natural (base-e) exponential function**

where a and b are constants and the domain is all real numbers.

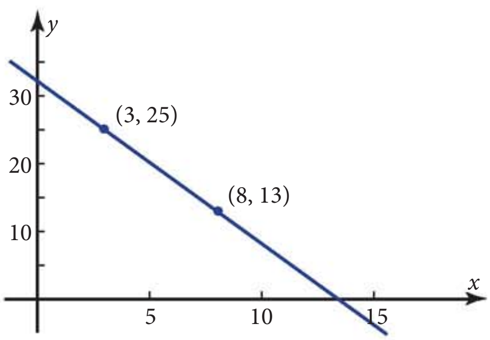
Note: The equations of these two functions can be generalized by incorporating translations in the x- and y-directions. You'll get $y = a \cdot 10^{b(x-c)} + d$ and $y = a \cdot e^{b(x-c)} + d$.

Base-e exponential functions have an advantage when you study calculus because the rate of change of e^x is equal to e^x.

In this exploration, you'll find the particular equation of a linear, quadratic, power, or exponential function from a given graph.

EXPLORATION 2-2: Graphical Patterns in Functions

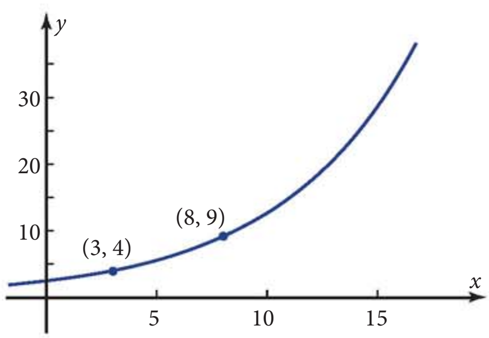
1. Identify what kind of function is graphed, and find its particular equation.



2. Check your answer to Problem 1 graphically. Does your graph agree with the given one?

3. Is the graph in Problem 1 concave up, concave down, or neither?

4. What graphical evidence do you have that the function graphed is an exponential function, not a power function? Find its particular equation.



5. Check your answer to Problem 4 graphically. Does your graph agree with the given one?

6. Is the graph in Problem 4 concave up, concave down, or neither?

continued